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Preface

This book covers all areas of science and technology. The contributions by the authors include microalgae, fatty acid, creativity, innovation, parametric, job satisfaction, coal mining impacts, environmental degradation, GIS, factors, mountain top clearance, water use, water resources, ground water, degradation, pollution, customer satisfaction, loyalty, mobile communication, logistic regression, candidate genes, anthocyanin, linseed, doubled haploid, maize, pollen, wheat, servitisation, service factory, service package, management model, manufacturing firms, root cause analysis, GEV model, seasonality, projections etc. This book contains various materials suitable for students, researchers and academicians in the field of science and technology.

Competitive Advantage through Service Differentiation: Evidences from Italian Manufacturing Firms

Roberto Panizzolo¹ and Alberto Maria de Crescenzo^{1*}

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ABSTRACT

The culture and the operational methods of service management have become a formidable competitive weapon even for manufacturing firms. The term "service factory" has been proposed for identifying that particular integration of products and services, achieved by the excellent manufacturing firm, where "service is a multidimensional concept". The creation of a service factory necessarily implies a radical change in the operational and organizational characteristics of the firm. In order to support manufacturing firms in adopting a service strategy, it is relevant on the one hand to identify the bundle of services which have to be provided for the customers and, on the other hand, to understand the implications for firm management model. As regards the first point, the paper proposes a framework which classifies the services along with two dimensions: time-dimension and target-dimension. The proposed framework is of interest for manufacturing firms because it allows a better recognition of services that are more perceptible for the customers. In the second part of the paper, authors discuss the implications of a service strategy adoption on the management model of manufacturing firms. In order to carry out this analysis, authors propose a model that combines four service dimensions with three decision-making categories (Organization, Methodologies and Technologies). In the end, the proposed framework has been applied in a sample of Italian hot water heater manufacturers and a case study analysis has been carried out.

Keywords: Servitisation; service factory; service package; management model; manufacturing firms.

1. INTRODUCTION

Everybody is in the service business. This is what Theodor Levitt wrote in his remarkable research in which he shown that the culture and operating methods of *service management* had become, even for manufacturing enterprises, a formidable competitive factor [1]. Since then, this topic has assumed a central role in manufacturing company strategies [2]. The search, by these companies, for a greater competitiveness is inextricably linked to the ability to offer a mix of products and services, in other words to meet the expectations and demands of customers in personalized, flexible and comprehensive way [3]. The aim is to overcome the traditional concept of offering just a product in order to embrace the integrated logic of "bundles" [4-10]. In other words, manufacturers have moved into service and customer solution fields to solidify their positions in increasingly competitive markets and grow their revenues and margins, leading to the well-documented shift from a goods-dominant logic to a service-dominant logic in business markets [11-14]. When the product "*evaporates*" and "*sublimes*" just offering a product is not enough: it is necessary a strategic approach aiming at offering more "value" to the customer through "solutions" instead of products [15,16].

To ensure a real customer focus, it is necessary to understand the service in its broadest sense, in order to take into account both the strategic-cultural issues and the operations ones. This entails a deep re-examination of the company mission, which requires a pronounced customer focus not only

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in terms of product attributes, such as functional capability and quality levels, but also in terms of benefits for the buyer. As Heskett states "it is crucial to understand which, among other aspects of the service provided to customers, are considered essential in view of advantage for the buyer" [17].

If the service development, as a source of competitive advantages, is important for the manufacturing firms; it is equally clear that the adoption of a service logic is critical for those companies. A first critical issue concerns the definition of a service package. A second point of reflection is related to the implications on the firm management model resulting from the adoption of a logic of service management. Therefore, the objective of this paper is twofold.

First, we aim at developing a model able to support manufacturing firms in developing a service package. Many firms are trying to mix products with services in an effort to boost revenue and balance cash flows. While the promise of combined offerings is great, it's easy to get them wrong. The problem is that too many companies do not think through exactly how to structure their combined offerings.

Secondly, in order to develop effective customer service competences for the development of a service strategy, the principles and the culture of service management must permeate the entire organization of manufacturing firms. In order to examine this topic, a model able to analyse the impact on firm management model - from adopting a service strategy - has been proposed. The model is derived from the cross-referencing of three groups of decision-making categories with the four fundamental dimensions of service: the resulting matrix identifies twelve areas of opportunity and intervention for the realization of a service management culture.

The reminder of the paper is structured as follows:

- Next section discusses the concept of "service factory";
- Section 3 examines the concept of service package and proposes a model helping in designing a product/service bundle;
- Section 4 proposes a model for analysing the impact of service strategy adoption on firms management model.
- Final section describes the case study results, the proposed model has been utilized in the Italian hot water heater producers sector.

2. THE SERVICE FACTORY: FROM THE "COMPANY VIEW" TO THE "CUSTOMER VIEW"

Robert Chase is the scholar who has most contributed to highlight the importance of service management in manufacturing firms. He has also emphasized the importance of combining product and service aspects in a competitive environment. Chase has proposed the term *service factory* [7,9] to identify the integration between products and services achieved by excellent manufacturing firm, where "service is a multidimensional concept: it can refer to doing something for/with the customer or it can refer to providing a service to another function of the business" [18]. As stated by Chase, the Service Factory can be seen as the final stage of an evolutionary process of a manufacturing firm, which has become firstly *traditional*, then *flexible* and therefore *service factory* [19]. These three different types of companies are characterized by different focus on management and different type of offered products; they could be represented respectively by the generic product, the expected product and the integrated/potential product as proposed by Levitt [20].

The *traditional factory* is the classic manufacturing firm dominated by a production logic that does not pay attention to final customer needs. In this case, the management focus is typically concentrated on the internal process of transformation, characterized by strong standardizations and high values of efficiency. It may lead to the detriment of customer satisfaction. For this type of company, the offered products are exclusively physical or generic and, in most cases, the customer service concept is intended with reliable delivery and requested products availability.

The evolution from *traditional factory* to *flexible factory* takes place under the pressure of new technologies, new production philosophies and new approaches to quality which have characterized the global industry in the '70s and '80s. They have enabled to achieve high levels of flexibility in the production system: it became possible for companies to adopt competitive defocused strategies and modify the production target from the unique pursuit of efficiency maximization to the achievement of high performances in many competitive variables. In the *flexible factory*, the management focus is still pointed inward company organization, nonetheless the wider offering to the customer goes beyond the generic traditional product according to the "expected product" defined by Levitt [20]. The concept of customer service is extended if compared to the previous case: the flexibility that characterizes this type of companies allows them to increase significantly the breadth and the depth of product range and to meet the demands of customization for the products that the customer intends to buy. However, also in the *flexible factory* the prevalent perspective is still traditional and mainly linked to product (delivery, availability, customization, etc.) rather than to the customer. In other words, the understanding of customer needs continues to be limited while considerable efforts and energy are devoted to the study and the improvement of production process functioning, to the design of innovative products, to the rational management of purchasing activities and to the development of *Total Quality* programs. Traditional management systems often limit the ability of manufacturing firms to truly implement an approach which takes really into account the aspirations, frustrations and desires of customers and this leads to a fracture or a missing link between the *company view* and the *customer view*.

For a manufacturing firm aimed to develop a product/service strategy, it is essential to recognize the profound differences between the two visions just mentioned, acknowledging that the customer view will be the most important success factor in the twenty-first century economy [21].

The *company view* is a traditional conception of process of value creation, a process where consumers are "outside the firm." Think for instance, to the approach generally applied to the personalization of a product or service. Inspired by the traditional view of value creation, focused on the company, managers strive to provide product or service to every customer with an affordable price. This process reaches its' peak with the mass customization approach. More recently, the information technology has offered new opportunities for producers in order to provide faster customized products, more economically and at lower cost, with the use of on demand production techniques easily applicable, thanks to the advent of the Internet. The variety of choices, due to the mass customization of products and services, are definitely capable of attracting the attention of customers. However, do they result in very satisfactory experience for the customer as well? How is the connection between technical product specifications and the real needs of the customers? The *company view* continues to limit the range of choices for the customer, as the company prepares and proposes only the options that are best suited to its own value chain rather than conforming to the preferences and specific wishes of customers.

Let's take another example: firms have readily adopted new technologies which reduce transaction costs, often forcing customers to perform operations previously managed by their personnel as it happens in many self-service systems. This evolution has provided indubitable benefits to customers in terms of increased rapidity and lower prices. However, this scenario has not always positive consequences for customers; in fact, managers often pay mainly attention to cost benefits guaranteed by these systems rather than to evaluate the impact on customer experiences (in extreme cases they do not even consider it).

Let us consider the case of call centres, which represent an incomparable opportunity for firms to interact positively with customers. A well-run call centre can turn from negative to positive a customer's experience, thanks not only for quickly problems solving and adequately questions responding, but also for proposing new ways to use the product or service provided by the firm with proactive spirit. However, the majority of firms waste this precious opportunity by providing automated call centre or managed by inexperienced and ineffective operators, whose productivity is measured in the amount of calls handled per working hour rather than the quality of customer experience.

There is no doubt that managers develop these systems with the best intentions, but they merely apply traditional management techniques. As a result, the majority of customer experiences with call centres are unpleasant, irritating and potentially harmful. The introduction of virtual operators, using technology aimed at reproducing natural language and speech recognition, forces the customer to learn and use the "*corporate language*".

The customer reaction to this situation depends on their level of expertise and culture, but also on their capability to tolerate what appears irritating to them: it can range from mild discomfort to a deep disillusionment and an ill-concealed anger [22].

As defined above, overcoming the *flexible factory* service approach takes place in the *service factory*. Chase and Erikson [19] proposed the concept of the service factory in which manufacturing personnel and the factory itself share a service mission that extends beyond the basics of reliable, flexible and cost-effective production. This new service mission realizes the change from the company view to the customer view.

In this approach, the company offers those products, components and services which represent the solution of the customer "problem" and ensures their compatibility and integration. The service factory combines the "high touch" characteristics (in the sense of customer proximity) typical of small companies and service companies in general, with the "high tech" characteristics typical of companies which use advanced technologies in business processes. The service factory is also characterized by a production logic that focuses strictly on the customer needs, with the production organization oriented on product flows and in which the aspects, related to human resources in general and customer service in particular, are critical key factors for business success.

It is clear that the establishment of the factory service implies necessarily a radical change in the design of organizational and production structure and of managerial processes. The first step is to develop a model able to recognize and to develop effective customer service in manufacturing firms.

3. IDENTIFYING THE BEST SERVICE STRATEGY: THE SERVICE PACKAGE

Service potential is more or less inherent in all products. For instance, regarding the business-to-consumer in the auto industry, services are crucial for attaining and maintaining profitability.

Also in *business-to-business*, the service component has always had a great importance because of markets concentration and needs of personalized performance, but more recently various elements contributed to their greater spread:

- The search for greater flexibility by enterprises, in order to deal with an increasing dynamic environment and cost reduction;
- The high level of investments required in R&D which is difficult to maintain by a single firm. The horizontal and vertical agreements between companies have multiplied in order to share resources and expertise;
- The development of operating models aimed at minimizing inventories (*just-in-time* models) and preventing from the beginning possible product defects. These choices require strong integration between buyers and suppliers, with processes of mutual adaptation and exchange of detailed information on production plans, logistics and customers' expectations;
- The constant search for new ways of value creation for customers, which encourages the establishment of interactive relationships between producers and users. These relationships take place along all the following stages: new products development, production, sale, delivery, post-sale.

Therefore, service is an asset of great importance for all manufacturing companies as such this activity may provide [23,24]:

- A decisive linchpin of customer loyalty;
- An important source of competitive advantage;

- A stand-alone business with high profitability.

In general terms, service strategy development follows a three-phase path:

- *High Manufacturing Intensity-Low Service Intensity*: the service is provided mainly to the product (rather than to the customer) to ensure continuity of performances (for example Technical Support). In economic terms, it is the value of costs which the customer would afford to repair and maintain the product in perfect efficiency;
- A balanced mix of *Manufacturing Intensity-Service Intensity*: the company realizes that the service provided is suitable, at least in part, to be sold at prices with significant margins of profit (think for example to the use of original spare parts during the warranty period). Therefore others services, supporting not only the product but also the customers, are provided. At this stage services can include a wide variety of activities, such as trade, transportation, information, education, health, and financial and professional services.
- *High Service Intensity-Low Manufacturing Intensity*: in this final stage, firms capitalise on the full range of services they could provide. Manufacturers compete by bundling services with products, anticipating and responding to a truly comprehensive range of customer needs [5]. In other words, these bundles consist of a combination of goods, services, support, self-service and know how, calibrated to meet the needs of the customer. These hybrid solutions of products and services combined into innovative offerings realize the shift from a goods-dominant to a service-dominant logic [25]. Competition is based on services offered and, often, physical products become commodities. Therefore, large quote of turnover comes from selling services. These considerations are graphically exemplified in Fig. 1.

		Manufacturing Intensity	
		High	Low
Service Intensity	High	Balanced mix of product-services	Competition based on service
	Low	Pure tangible good	

Fig. 1. From product-based strategy to service-based strategy

The first step in designing a new product/service bundle or assessing its effectiveness, is to evaluate its elements from the perspective of both the buyer and the seller. Sasser *et al.* were among the first authors who studied this topic: in their book they coined the term “service concept”, which they defined as the total bundle of goods and services “sold to the customer and the relative importance of each component to the customer” [26].

Originally, the total service package consisted of three elements: 1) facilitating goods; 2) explicit services; and 3) implicit services. Since then, the service concept elements have been refined and expanded conceptually by various authors [17,27- 31]. We distinguish between facilitating goods and facilitating information. An interesting definition of service package is that one provided by Roth and Menor: the authors define it as a portfolio of core and peripheral service elements. The core service comprises five elements: 1) the *supporting facilities*, which are the physical and structural resources that must be in place for the service to be delivered; 2) the *facilitating goods*, that comprise the materials, supplies, and merchandise that are used or consumed in the service delivery process; 3) the *facilitating information* that supports or enhances the execution of the explicit services; 4) the *explicit services* that represent the customer’s experiential or sensual benefits; and 5) the *implicit services*, which are characterized by psychological benefits or more tacit aspects of the service that customers may sense only vaguely [32].

In general, studies of literature tend to differentiate the elements of the service package:

- Between tangible items (goods) and intangible elements (services);
- Between components which form the *core* of the package and components of *peripheral* subsystem. The principle that differentiates the *core* from the *peripheral* is based upon the different benefits for the customer. Core elements are tied to the primary needs and necessities, something absolutely necessary. Peripheral components refer to wants and desires: the first are a feeling for something you lack. A desire is the craving for apprehending you want; therefore peripheral components identify a state of positivity or well-being, as customer's sense satisfaction.

The distinction between *core* goods/services and *peripheral* goods/services is not always clear. An element that is crucial for the realization of the *core* offering in a given situation, can become an auxiliary one in another context. Moreover, it is important to mention that in the situations where the *core* is virtually undifferentiated, peripheral goods/services will condition the customer's choice. Finally, all the elements of the service package are "dynamic" in the sense that the importance of an element can vary in time due to changes in customers' expectations.

To define more effectively the service package is useful to refer to other models in the literature which address this issue by adding new perspectives of analysis.

In the model of Marceau *et al.*, reproduced in Fig. 2, the viewpoint of analysis adopted by the authors appears clear: the elements of the service package are not categorized only by their nature (goods vs. services and central vs. peripheral), but also by their spatial-temporal dimension. That is, services integrated with products *before* purchase (this strategy is called *product-service integration*) and services provided with the products *during* or *after* purchase (the so-called *product-service packaging*).

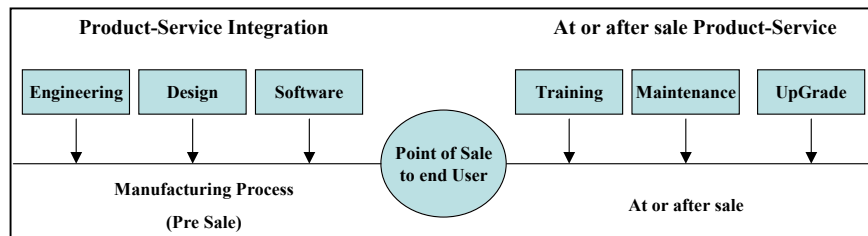


Fig. 2. The Product-Service Integration model [33]

Another interesting model has been proposed by Mathieu [34]. Her model makes a distinction between a *Service which Supports the supplier's Product*, SSP (a typical illustration of such a service is an after-sales service), and a *Service which Supports the Clients action in relation to the supplier's product*, SSC (for example a training service). The first type of service fits the traditional view of a services offering in the business market, whereas the second requires a more advanced perspective of the product services offering.

As shown in Table 1, the two groups of services differ in several characteristics: SSP have a low relational intensity and they are relatively standardized and linked to physical aspects; unlike the SSC services.

Table 1. The model of Mathieu [34]

	SSP ^a	SSC ^b
Direct recipient	Product	Person
Intensity of the relationship	Low	High
Customization	Low	High
Predominant variables	Physical evidence - process	People

Notes: ^a Service supporting the supplier's product

^b Service supporting the client's action in relation with the supplier's product

Starting from the literature review, a model able to support manufacturing companies in developing a service package has been developed. The model suggests that, for a better understanding of the services which may be offered, it is necessary to:

- Identify three different time phases, each of them characterized by different opportunities for customer service according to life-cycle management approach (e.g. Pre-purchase, Purchase, Post-purchase);
- Distinguish between product support services and customer support services. In the first case services are related to products offered (that is to say, services aimed at sustain the performances of the product over time). In the second case, services are directed to the customers and are designed to simplify and facilitate buying decision process.

Cross-referencing these two variables allows us to build a matrix, illustrated in Fig. 3, which depicts the proposed model: each intersection between row and column represents an "area of opportunity" for the design of an integrated product/service package. For the sake of clarity, examples of services that can be offered in the business to consumer and business to business contexts, are shown.

The approach contained in the proposed model is consistent with a trend now increasingly widespread in industry. When services added to the products reach significant levels of importance and implies for the enterprise a substantial financial commitment, there is the propensity to separate the first from the second ones. In this way services are better perceive and appreciate by the customers and can be priced and purchased separately from the goods: think for example to the case of contracts for technical assistance, special forms of insurance for the product, the possibility of extending the duration of the guarantee for a fee, and so on.

The benefits are clear for both the seller and the buyer. Services may be enhanced and are more noticeable to the customer and their costs and revenues are more controllable on the part of the suppliers. Moreover, for the customer it is possible in this way to choose services considered necessary, discarding others, resulting in a final mix more flexible and tailored to specific needs.

	Pre-Sale	Sale	Post-Sale
Services supporting product	<ul style="list-style-type: none"> • Product Configuration • Financial and insurance services 	<ul style="list-style-type: none"> • Installation Services • Shipping and delivering services 	<ul style="list-style-type: none"> • Technical assistance • Recycling
Services supporting customer	<ul style="list-style-type: none"> • Cultural services • Exhibitions and conferences • Access to virtual communities 	<ul style="list-style-type: none"> • Recreational services • Consulting services and assistance 	<ul style="list-style-type: none"> • Training services and research • Hotel and restaurant services

Fig. 3. The proposed model for the design of a product/service package

The tendency to offer products integrated with services, but at the same time to separate the price of the "services" from "tangible property", contributes to increase the weight of services in contemporary economies and allows companies to better positioning their products differentiating them from the competitors. It also enables to appreciate the service importance for the customer (everything that is priceless is generally considered even worthless) but at the same time it implies, for companies which deal prevalently with manufacturing processes, the consequence of changing their corporate culture, personal values, organizational structure and management systems. In the next section we will discuss about these topics.

4. DEVELOPING A SERVICE STRATEGY: IMPLICATIONS FOR THE FIRM MANAGEMENT MODEL

Transitioning from product manufacturer into service provider, constitutes a major managerial challenge. Services require organizational principles, structures and processes new to the product manufacturer. New capabilities, metrics and incentives needed are not only relevant, but also the emphasis of the business model changes from transaction to relationship based. Developing this new set of capabilities will necessarily divert financial and managerial resources from the traditional sources of competitive advantage for the organization.

In order to develop effective customer service competences for the development of a service strategy, the principles and the culture of service management must permeate the entire organization. This requires in the first instance a clear explanation of the key components that must qualify the customer service. Among the various service dimensions mentioned in the literature, those identified by Chase [19] in the model of *service factory* are considered particularly significant and distinctive for excellent companies: services must be designed according to the following four perspectives:

- *Information;*
- *Problem solving;*
- *Demonstrations;*
- *Supports.*

The service is "*information*" when the company provides to its customers critical data and relevant information which are not just about the functional and performance characteristics of the products sold but also more generally about all aspects related to the acquisition, functioning and use of the product, such as the order progress, the possible ways of financing the product purchase, the training services available, etc. It is clear that this ability to provide information (that plays a fundamental role in the case of business-to-business transactions) is of utmost importance in the current environment characterized by high levels of technological performance of products and continuous attempt by companies to improve these performances and to vary the global offer characteristics. Think for example to the OnStar program of General Motors Corporation. It is a telematics application that provides subscription-based communications, in-vehicle security, hands free calling, turn-by-turn navigation, and remote diagnostics systems [35].

The service is "*problem solving*", when the company provides a "service package" that solves completely and continuously customer's problems. In offering this integrated package, the firm is able to reduce the customer's effort that he/she should face alone trying to integrate the individual package components. In this context the case of Sumerset is interesting [35]. It is the largest manufacturer of floating houses in the world based in Kentucky. It is a market mainly dominated by companies located next to the end customers; they want a house that fits perfectly their needs and desires. Customers expect that the manufacturer is willing to adapt, change, redesign and rethink the project as many times as necessary to achieve the desired customization level and they want to participate in every stage of design and construction. Sumerset has set up a system able to get, even at distance, the spirit of building tailored-made houses. Firstly, it has organized project management in such a way as to enable a strong and continuous customer engagement thanks to a great use of information and communication technologies. The intensity of the relationship with customers requires Sumerset technicians to have strong creative mind and a good presentation and problems solving skills with a great willingness to answer the related questions. The ongoing dialogue between Sumerset and customers helps the company to identify and correct problems by a proactive way instead of reactive one.

The service is "*demonstrations*": this refers to the ability to enhance sales and marketing efforts by showcasing, the products, the technology, equipment or production systems which the company is trying to sell, both on-site and at the customer location. By highlighting particular strengths or excellence of company, such as the quality management system or the use of specific technologies and management skills, it is possible to improve and strengthen the company image and reputation. An interesting example in this context is the fashion house Prada, with its first "*epicenter*" store in New

York [35]. Opened in December 2001, it is an experimental store designed to improve the shopping experience of its customers through the use of interactive technologies. One of the key technologies applied in this shop is the system of smart labels, which come with each garment and allow salesperson to immediate access to a variety of information such as sizes and colours currently available. The content of the label also includes drawings, video clips and samples of colours that customers can watch on monitors scattered throughout the store. Ultimately, the store is an exclusive boutique, a public space, a gallery, a performance space, a laboratory with the specific aim to enrich the shopping experience.

The service is "*supports*" when the company makes a range of services available that complete and enrich the offer to the customer. An example of excellence in this area is John Deere, the historic and well-known manufacturer of agricultural machinery [35]. The company is pioneering the introduction, on its combine harvester, of global positioning systems (GPS) and special biosensor which is capable of measuring the oil content of cereals or of distinguish between crop and weeds. The benefits are enormous: farmers can weigh herbicides according to the soil conditions of each zone; driving assisted by GPS assures farmers of accurate repeatability of treatments, eliminating any excess, and it allows to work on steep ground reducing time, fuel, labour and fertilizer costs; preparation, cultivation and irrigation of soils have less problems; farmers are more productive, since the costs per unit area tend to decrease. New technologies also help operators to monitor their equipment, allowing them to check continuously the conditions of operation and location. By integrating technologies in remote diagnostics system, the Deere is able to warn farmers that some machine might fail, avoiding costly surprises during the operations of planting or harvest for customers. In short, the whole process revolves around the figure of the farmer.

4.1 Adopting Service strategy in Manufacturing Firms and Managerial Implications

After listing the main dimensions that must characterize the services within a service factory logic, the challenge now is to examine what are the implications for the firm's management model resulting from adopting such a logic. For this purpose it may be useful to identify appropriate strategic decision categories. The strategic decision categories in the manufacturing field have been extensively discussed in literature. Hayes et al. [36] identify ten categories divided into structural (capacity, facilities, technology, vertical integration) and infrastructural (production planning and control, quality, organization, workforce, new product development, performance measurement systems). Skinner [37] proposes five strategic decisional categories: structural (plant and equipment) and infrastructural (production planning and control, organization and management, labour and staffing, product design/engineering). Fine and Hax [38] propose six strategic decision-making areas, three of which are structural (capacity, facilities, process and technologies) and three infrastructural (product quality, human resources, scope of new products). In this paper we have chosen to pick three groups of strategic decisional variables as defined by De Toni et al. [39]:

- Organization and management;
- Methodologies and techniques;
- Technologies.

Each group of categories represents a framework within which management makes strategic choices which have operative implications and effects on performance.

The first group of strategic decision categories — organization and management — includes elements which can be traced back to the external and internal organizational structure of the company and to the role of management; these are:

- Configuration and co-ordination of the activities;
- The level of concentration/decentralization of activities and the way in which they are co-ordinated;
- Agreements and coalitions;
- Internal organization structures and integration mechanisms;

- Managerial roles: The role of the manager in integrating activities to obtain a continuous improvement of the operating system.

The second group of strategic decision categories is represented by methodologies and techniques, considered both as approaches to process management and as formal techniques and procedures. Among the most significant systems are:

- Simultaneous product-service design system;
- Quality management system;
- Production control system
- Order management system.

The third and final group of strategic decision categories is represented by technologies. They can be divided into the following:

- Process technologies of all the phases: design, transport, handling, storage, production and distribution;
- Information technologies for collection, elaboration and communication of data (information and communication systems);
- Technologies incorporated in the product aimed at improving quality and reducing costs.

Starting from the intersection of the three groups of decision-making categories with the four fundamental dimensions of customer service previously described, it is possible to build up the matrix in Fig. 4 that identifies twelve areas of opportunity and intervention for the realization of a service management culture.

In the following, for each of the three strategic decision categories, some key considerations for developing a service strategy will be made.

Strategic Decision Categories	Service Dimensions			
	Information	Problem Solving	Demonstrations	Supports
Organization and Management	Choices in terms of: <ul style="list-style-type: none"> • configuration and co-ordination of the activities • organizational structures and integration mechanisms • managerial roles • human resource management • 			
Methodologies and Techniques	Choices in terms of: <ul style="list-style-type: none"> • quality management system • manufacturing planning and control system • order management system • 			
Technologies	Choices in terms of: <ul style="list-style-type: none"> • process technologies • information technologies • design technologies • product knowledge • 			

Fig. 4. Service dimensions and strategic decision areas: A model for the development of a service strategy

Organization and Management

In this area there are two important issues for a manufacturing company committed to developing a service strategy. Firstly, human resource management is a critical asset, much more than technology or capital for determining the proper functioning of the organization at all levels [40]. Some studies [41,42] show that the key to provide a high quality service is the proportion between customers' expectations and perceptions, eliminating the differences between them. In this context the so-called "soft skills" - considered as the ability to improve communication processes between the company and its customers (competence, courtesy, availability, readiness, image among others) - has proved to be of fundamental importance [43].

Secondly, the competences, for offering an excellent customer service, tend increasingly to be located in the so called "extended enterprises" [44]. In other words, providing effective service to market requires to rely on resources of other companies and external communities in order to integrate them in a structured network [45]. The creation of a competence network allows to open the doors of global markets also for small companies with limited resources. These companies do not need longer to invest heavily in assets, such as production facilities, distribution channels and logistics systems, scattered in various parts of the world. In other words, they do not longer deal with the traditional allocation of resources but on their synergistic reorganization [46].

Methodologies and Techniques

According to service management approach, the will to satisfy better and in more extensive way the customer needs, requires major changes in the characteristics of many management systems [47]. First of all, with regard to production planning and control, it is known the importance of working with a *pull* logic. According to this logic, each work centre operates on the basis of the requests of the downstream centres, seen as customers. The logic that connects the upstream and downstream centres is therefore that of service. To ensure such mode of operation is necessary to provide a strong exchange of information among all actors of the chain and to develop the full responsibility - and the consequent authority - of workers in the operational management. In fact, they operate with a direct control (visual) of the process in pursuance of detecting immediately problems and difficulties.

The adoption of a service strategy has also deep impacts in the area of quality [48]. If the achievement of zero defects in every phase of the production cycle is fundamental to use *pull* logic, it is equally clear that the concept of quality in a service logic is not just the realization of a product without defects but the satisfaction of customer expectations [49]. In this regard, many experiences have demonstrated the importance of design techniques such as Quality Function Deployment (QFD) for involving customers in the process of designing and developing new products/services starting from their needs/expectations [50]. Fully meeting the customers' expectations means also that the quality is full achieved in customer service, in pre- and after-sale service. In this area, finally, is mandatory the setting up of a formal system of service recovery seen as the redemption actions to customers who have not met satisfaction of their needs and their expectations [51,52]

Technologies

Finally, technologies play an important role for achieving a service strategy. Considerable opportunities in this field are offered in particular by information technologies [53]. These technologies allow to revolutionize the methods traditionally used to provide information to customers and for the management of internal production processes and for managing corporate data [54].

The availability of computer networks and software systems makes possible connections between the customer and the plant, making visible the progress of orders and increasing customer involvement in the production process. The real-time systems allow the management of production activities on the basis of the actual data of consumption and production by ensuring flow production methods. The adoption of flexible automated technology in production makes feasible the simultaneity of production and consumption and then the adaptation to customer's requirements. Moreover, the enrichment of the product is achieved thanks to the systems that allow value-added processing, providing

information to the customer [55]. Finally, technologies are becoming increasingly important also for remote diagnostics or even for remote assistance. It is clear that the possibility to operate with more "user friendly" systems increases the number of customers and the use of such systems.

5. CASE STUDY ANALYSIS

As mentioned above, this study was conducted within a sample of Italian manufacturer operating in the hot water heater industry. This sector has been analysed in a previous research performed by the authors [56], therefore in this section a new prospective of analysis is proposed: the management choices in terms of strategic decision are depicted. According to a recent study of the Italian Association of Manufacturers of Heating Industry [57], this sector is a mature market characterized by a slow growth rate. In this standpoint, many companies identify themselves not only as product-oriented manufactures, but progressively as solution-oriented organizations, which implies services as fundamental element to face the economic stagnation. Consequently, the simultaneous development of products and services for noticeable combination of tangible and intangible assets is characterized by increasing importance. In this perspective, services are not only add-ons to products, but rather represent a valuable part of firm' value proposition.

The Italian manufacturing market for heating in the residential and professional sector is extremely varied; there are about 65 brands and 50 manufacturers. Alongside a small number of large firms that offer a wide range of products and brands, numerous small and medium size manufacturers operate mainly in local areas with a limited range of products. Referring to Fig. 1, this sector is in transition from a balanced mix of manufacturing intensity-service intensity to a context characterized by high service intensity and low manufacturing intensity. In fact, the hot water heater represents thus far a marketable commodity.

As for the proposed framework, this industry sector was analysed in order to highlight which services manufacturers already offer to their customers. Moreover, our analysis depicts which actions in terms of technologies, organization and management, methodologies and techniques have been implemented.

A distinguish characteristic of this sector is that manufacturing firms sell their products to installers that are therefore their *real* customers rather than the final consumers. Installers are at the end of the distribution channel and in direct contact with consumers; therefore they have enormous influence over the choice of brand and related products [56]. Nevertheless the installers are the *real* customers, it is clear that the manufacturers still have to offer their products/services to the final consumers that may influence the hot water heater purchase process.

In the Fig. 5, the services provided by the main 50 manufactures are shown. A traditional benchmarking approach was used to identify which are considered the most recurrent services. In order to classify the services proposed in this sector and propose a general overview, the authors identify 6 categories based on the following stages:

- *Order trigger*: the configuration of services grouped in this section may arise from the customer's or designer's requirements;
- *First contact with supplier*: the services of this segment meet the need of firm awareness in the market and product visibility among the customers;
- *Offer to the customer*: the services proposed are focused on quote preparation and product presentation in order to support the product choice;
- *Second contact with supplier*: the services of this section support the purchase process in terms of sale channels and product delivery, the product has been already chosen;
- *Work execution*: all the services that support the installation in terms of information, manuals and consultancy are here grouped;
- *After Sale*: lastly, in this section typical services dedicated to the *after sales* are described

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			# Firm																																																	
			# Services	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	43	44	46	47	48	49	50	
Services			3	11	8	11	3	15	6	9	8	12	5	9	9	4	5	14	6	8	8	20	8	8	17	13	9	9	19	4	7	2	24	5	5	10	3	8	12	8	11	5	3	5	10	6	5					
Order trigger	From Hydrothermal Systems Designer	Training courses for designers	6																																																	
		Consultancy for design	8																																																	
		Consultancy for products to be used	7																																																	
		Norms and laws literature	2																																																	
	From Customer	National customer service number	3																																																	
		Hotline number	5																																																	
First contact with supplier	Promoters	Direct	4																																																	
		Indirect	4																																																	
		Wholesaler	2																																																	
	Product range awareness	Direct	Promotion Days for the product	2																																																
			Demonstration at point of sale	4																																																
			Promotion activities and presentations in major cities	6																																																
		Indirect	Internet site	40																																																
			Download of technical manuals	4																																																
			Newsletter	3																																																
			Backlinks archive	1																																																
	Firm awareness	Visits	Electronic Catalog	8																																																
			Specialized press participation	4																																																
			Technical videos	2																																																
		Award	Information material for new products	2																																																
			Plant visits	6																																																
			Headquarters visits	2																																																
	Promotion	Directions to reach the Plant / Headquarters	3																																																	
		Awards for purchases	5																																																	
	Offer to the customer	Quote preparation	Promotional activities	8																																																
			Advertising campaign on media	1																																																
Product choice			3																																																	
Presentation		Paper guide for product selection	5																																																	
	Product selection software	5																																																		
Catalogues and leaflets	Catalogues and leaflets	30																																																		
	Business themes Conferences	3																																																		

				# Firm																																																		
				# Services	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Services				3	11	8	11	3	15	6	9	8	12	5	9	9	4	5	14	6	8	8	20	20	8	8	17	13	9	9	19	4	7	2	24	5	10	3	8	12	8	11	5	3	5	10	6	5						
Second contact with supplier	Material Purchase	Direct channel	Manufacturer agent	24	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			
		B2B applications	2										■																																									
		Indirect channel	Retailers information on company site	3																																																		
	Delivery	Immediate	Continuous product availability	2																																																		
		Deferred	Delivers within 24 hours	3																																																		
			Delivers within 48 hours	1																																																		
Work execution	Training	Courses	Technical courses for installers in the city	6																																																		
			Technical courses for installers	18																																																		
	Manual	Technical product literature (manuals)	14																																																			
		Technical manuals serie	6																																																			
		Technical manuals download	7																																																			
		Information	Magazines	Electronic technical information magazine	2																																																	
	Technical information magazine			1																																																		
	Conferences		Technical issues conferences	5																																																		
	Support	Installation consultancy	Installation consultancy	9																																																		
			Financing	Credit	1																																																	
	After Sale	Breakdown reporting	Telephone	National customer service number	3																																																	
				Hotline number	5																																																	
				Hotline fax	1																																																	
Internet		On-line product guide	11																																																			
		On-line breakdown notification	9																																																			
Intervention		Administration	After-sales customer care	15																																																		
			5-year Extended product replacement guarantee	1																																																		
			Service centers software	1																																																		
Network	Authorized customer service centres	29																																																				
Online	Internet	Guest area on web-site	11																																																			
		Discussion forum	2																																																			

Fig. 5. Overview of services provided in the Italian hot water heater industry

Moreover, the Fig. 5 shows the total amount of services proposed by a single firm (represented in the columns highlighted in green) and how many times a specific services is proposed among the firm's sample (represented in the #Services row).

From the Fig. 5, the key firms in terms of higher number of services provided, has been identified and the Fig. 6 shows these most relevant manufacturers and their sales volume.

Referring to the proposed model, in the Fig. 7 a selection of services are distributed by way of example with the logic of a product/service package design as shown in Fig. 3. Due to the market characteristic, we can identify services tailored for both installers and final consumers. The product/service package examples are cross-referenced in relation to the two dimensions identified: namely *time phases* and *customer/product support services*.

	# Services Provided	Sales Volume (Millions of Euros)
<i>Firm 34</i>	24	420
<i>Firm 20</i>	20	130
<i>Firm 21</i>	20	80
<i>Firm 30</i>	19	156
<i>Firm 25</i>	17	66
<i>Firm 6</i>	15	92
<i>Firm 10</i>	14	290
<i>Firm 26</i>	13	30

Fig. 6. Key Firms: Amount of service provided and sales volume

	Pre-Sale	Sale	Post-Sale
Services supporting product	<i>For final consumers</i>		
	<ul style="list-style-type: none"> • Demonstration at point of sale • Consumer credit promotion 	<ul style="list-style-type: none"> • Installation services • Delivers within 24 hours 	<ul style="list-style-type: none"> • 5-year extended product replacement guarantee • Scheduled maintenance plan
Services supporting customer	<i>For installers</i>		
	<ul style="list-style-type: none"> • Information material for new products • Online product guide 	<ul style="list-style-type: none"> • Continuous product availability 	<ul style="list-style-type: none"> • On-line breakdown notification
Services supporting product	<i>For final consumers</i>		
	<ul style="list-style-type: none"> • On-line product guide • National customer service number 	<ul style="list-style-type: none"> • Installation consultancy 	<ul style="list-style-type: none"> • Newsletter • Technical manuals download
Services supporting customer	<i>For installers</i>		
	<ul style="list-style-type: none"> • Sales training courses • Online availability of up-to-date norms and laws 	<ul style="list-style-type: none"> • Product configuration software • Merchandising and personalised clothing 	<ul style="list-style-type: none"> • Technical courses for installers • Forum for discussing technical and managerial problems

Fig. 7. Examples of services provided in Italian hot water heater industry.

Finally, the Fig. 8 shows the key firms' outstanding choices for each of the three strategic decision categories proposed in the model.

For instance the Firm 34, which has the highest number of services provided, has implemented the "Installers Lifecycle Management Program" in the perspective of *organization and management* strategic decision. This program consists in supporting and managing all the issues related to the installers, considered as a focal element, with a structured approach as in the case of firm's employees. Considering the *methodologies and techniques*, an outstanding decision is the implementation of quality function deployment (QFD) in analyzing and capturing customer's needs. In regards to *technologies*, noteworthy is the implementation of an integrated remote control system, called *RICLOUD*, which ensures high performances, flexibility and compatibility with devices from other manufactures. Some key firms are involved in a Lean manufacturing transformation plan and, therefore, they have implemented several strategic decision in this direction, e.g. kaizen promotion office, pull planning, continuous improvement system and Skill Matrix. Another initiative is the implementation of modularity principles to achieve reductions in time and cost of delivering customized services. In the category of *Methodologies and Techniques*, the *Firm 30* is employing the concepts of Factory 4.0 in producing, designing and managing its products while the *Firm 25* decides to imply the "NZEB" - Nearly Zero Energy Building - precepts in its product design. Lastly, in the field

of *Technologies* the key firms have largely realized web-based solutions such as mobile app, cloud and social platforms. For instance, the dashboard lifecycle emission is a web-based solution that allows customers to trace and monitor the greenhouse gas emission and energy consumptions.

	Organization and management	Methodologies and techniques	Technologies
<i>Firm 34</i>	• Installers Lifecycle management program	• QFD methodology used for capturing and analysing customer needs	• RiCLOUD remote smart control program
<i>Firm 20</i>	• Effective Service Recovery System	• Pull planning production	• Hot water heater maintenance internet based
<i>Firm 21</i>	• KPO - Kaizen Promotion Office	• Risk management methodology for assessing customer profile	• Customer order tracking system
<i>Firm 30</i>	• Horizontal agreements for " <i>Solar Water Heating</i> " product development	• Design, building and managing "4.0 Hot water heater"	• 3D Simulation software for hot water heater installation evaluation
<i>Firm 25</i>	• Continuous Improvement System	• "NZEB" hot water heater design	• Mobile App for hot water heater remote control
<i>Firm 6</i>	• Service modularity approach	• Effective technique for Measuring Service Quality	• Electronic maintenance leaflets
<i>Firm 10</i>	• Installers award ceremony	• Use of big data for improving customer experience	• Web-based dashboard lifecycle emission
<i>Firm 26</i>	• Agencies for installers relationship empowerment	• Full implemented Skill Matrix for Multifunctional Workers	• Guest area and forum Web-Site, implementation based on a social media

Fig. 8. Examples of managerial decisions taken by key firms in the three strategic areas to support a service strategy

6. CONCLUSIONS

This paper has analysed the implications of adopting a service management logic for manufacturing firms. In the first part of the paper a model has been developed for defining the service package. The model identifies three different time phases, each of them characterized by different opportunities for customer service according to life-cycle management approach (e.g. Pre-purchase, Purchase, Post-purchase). Moreover, the model distinguishes between product support services and customer support services.

In the second part of the paper, a framework for analysis is proposed that goes through three levels of decision-making categories and four dimensions of service. The resulting matrix identifies twelve areas of opportunity and intervention for the realization of a service management culture.

In the third part of the paper, the models previously developed have been used to study the Italian hot water heater industry. In particular, the model of Fig. 3 has been utilized to map the set of services provided to market by the major companies of this industrial sector. It has emerged that according to the model proposed, in designing the product/service package these firms have paid attention to both the spatial-temporal dimension of service (i.e. before, during and after purchase) and the final recipient of service (i.e. product support services and customer support services).

In addition, the choices that these companies have made in terms of organizational and management systems, operational methodologies, and technology tools used to support their service strategy, have also been studied. In conducting this analysis the model for the development of a service strategy in Fig. 4 has been applied, it allows to clearly distinguish the three strategic decisional areas and to depict them.

The application of the two models developed in the paper to the case study allows to evaluate the capability to assist companies in designing the service package and assessing the implications that result from the development of a service strategy. In this perspective, the results are positive and promising. Anyway, it also emerged that there is room for improvement. In particular, the proposed models have difficulties in recognizing strategic orientation priorities, in identifying which distinctive capabilities manufacturers must develop to generate successful service package and in pointing out which specific resources manufacturers have to leverage to build these distinctive capabilities. Further research is therefore needed to properly address these issues.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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